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Overdose—The Early Treatment

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THE ACCIDENTAL or purposeful ingestion of large quantities of drugs is epidemic! Emergent care of an overdosed patient cannot be solely the responsibility of the emergency department physician, for in order for treatment to be most effective, it must be rendered early. Therefore, all physicians must be prepared to deliver immediate care for this potentially lethal condition. Unfortunately, although the basic goals of therapy are simple, many physicians are unfamiliar with the details of treatment. Much of what many of us have learned is based on anecdotes, and perhaps the scientific principles of therapy have not been adequately stressed. In addition, many of the reviews of the treatment of drug ingestion are quite general, making detailed information difficult to acquire.^{2,3} With these thoughts in mind, we have attempted to provide concise, practical information for the early care of overdosed patients. Much of the body of data reviewed is based on studies *in vitro*, in animal models or in children, but the recommendations are quite applicable to adults. We will not attempt to describe long-term therapy, but will focus only on immediate care.

General Approach

The approach to an overdosed patient is divided into: (1) rapid evaluation, (2) critical support, (3) minimization of absorption and (4) general or specific therapy. The emphasis will vary depending on the presentation. A patient who walks into an office or emergency department able to relate the history of having taken an excess

quantity of drugs, and in whom vital signs and mental status are normal, usually presents little problem initially. The emphasis is to minimize drug absorption as quickly as possible. However, care of a patient with central nervous system depression, hypotension or depressed respirations must have different emphasis. As in any critically ill patient, attention is directed toward maintenance of adequate airway, support of respiration and correction of hypotension. Only then can the physician turn to further evaluation and treatment.

Rapid Evaluation

When a stuporous or comatose patient is first seen, certain guidelines must be kept in mind. Because the history may be unreliable, one should not assume the patient is simply an overdose victim. Finding empty bottles at home, a history of suicide attempts or a history of depression may suggest overdose, but should not lull the physician into a false sense of diagnostic security. Even when a definite history of ingestion is available, other conditions such as hypoglycemia, head trauma or infection may be superimposed. Therefore, after obtaining a blood sample for a glucose determination, a bolus of 50 percent solution of dextrose should be given intravenously, and a rapid but careful physical examination should follow.

Certain physical signs are helpful when evaluating a possible overdose patient with an abnormal mental status. Small pupils may be seen in overdose of propoxyphene, organophosphate insecticides or narcotics. Therefore, if needle marks or miotic pupils are noted, 0.4 to 0.8 mg of naloxone IV should be administered to an adult and 5 to 10 micrograms (μg) per kg of body weight to a child. This drug is free of agonist properties and its use entails little or no risk. Overdoses of heroin, narcotic analgesics, pentazocine and possibly propoxyphene may be expected to respond within 1 to 2 minutes.⁴ Dilated pupils as a specific sign are less useful, but may be a clue to ingestion of glutethimide, atropine, scopolamine amphetamines, cocaine or tricyclic antidepressants. Breath should be examined for the characteristic pungent odor of ethchlorvinol, alcohol, acetone or a fetor hepaticus. The head should be searched for bleeding, Battle's sign, "raccoon eyes," cerebrospinal fluid leakage from nose or ears or other evidence of trauma. One should look for focal neurological findings which are unusual in uncomplicated overdose and should suggest an intracranial lesion. Nuchal rigidity might indicate sub-

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arachnoid hemorrhage or meningitis. Swelling of the limbs or pronounced muscle tenderness could be due to rhabdomyolysis with a possible compartment syndrome and may herald peripheral ischemia, neuropathy, hyperkalemia or myoglobinuria.

Certain laboratory data can be useful in evaluating possible drug overdose patients. Even with scant physical findings, an x-ray film of the chest may show pulmonary edema. Tests of arterial blood gases might show profound hypoxia due to pulmonary diseases or hypoventilation and unsuspected acid-base derangements may be detected. Findings on an electrocardiogram may show supraventricular or ventricular arrhythmias or even heart block of various degree.

Minimizing Absorption

After a patient has been stabilized and evaluated, attention must turn to minimizing further absorption of the toxin from the gastrointestinal tract. The following techniques are available: (1) evacuation of the stomach by emesis or aspiration-lavage, (2) adsorption of toxin by activated charcoal or (3) evacuation of the gastrointestinal tract with purgatives.

The time elapsed since ingestion is an important factor when considering evacuation of the stomach. To be most effective, therapy should be initiated early, and if time from ingestion can be accurately determined, certain guidelines are applicable. Most authors recommend emptying the stomach if the patient is seen within four hours of ingestion.⁵ Salicylate overdose, one of the common drug poisonings in children, is an exception and stomach evacuation has proven valuable even after delays of nine to ten hours.⁶ We have also obtained substantial amounts of particulate return after four hours in patients in whom there is severe central nervous system (CNS) depression or pronounced ileus. Therefore, in this set of patients, we advise evacuating the stomach even if six to eight hours have elapsed since ingestion. Matthew adds that emptying the stomach should also be undertaken “. . . if the time of ingestion is not known and the patient is unconscious.”⁶

The two methods of emptying the stomach are induction of emesis or gastric aspiration-lavage. Despite much interest in the subject, neither method has been accepted as superior by all. Boxer and co-workers compared ipecac-induced vomiting with gastric lavage for acute salicylate intoxication in adolescents and found emesis more

effective than lavage.⁷ Corby and co-workers found apomorphine-induced vomiting preferable to lavage and ipecac-induced emesis less satisfactory than either in canine models.⁸ Abdallah and Tye showed emetic-induced emesis superior to lavage.⁹ However, Matthew feels the emetics may produce protracted vomiting, shock, CNS depression and greater tendency toward aspiration—and are therefore dangerous.¹⁰ Although definite evidence showing one method superior to the other is lacking, most authorities prefer emesis for emptying the stomach when applicable.²

Physicians must be aware of the contraindications to the induction of emesis which include pronounced CNS depression, ingestion of caustic agents and ingestion of convulsants. In no patient should emesis be induced unless the patient is alert enough to communicate and a good gag reflex is present. With petroleum distillate poisoning many advise against the use of emesis,^{2,11} but Shirkey recommends the use of syrup of ipecac in patients who have ingested large quantities of these hydrocarbons and are seen early.¹²

There is also controversy regarding which pharmacological emetic is best. The two most popular agents are syrup of ipecac and apomorphine. Syrup of ipecac (not fluid extract of ipecac, which is 14 times more concentrated and should not be used) is readily available, acts both centrally and as a gastric irritant and is reliable.¹¹ However, it is adsorbed by activated charcoal, takes approximately 14 minutes to be effective¹³ and requires a cooperative patient. The recommended dose is 15 to 20 ml in children and 30 ml in adults. At least a quart of water should be given to adults to facilitate absorption of the ipecac and to prevent dry retching. Proportionately smaller amounts of water are used in children. If the first dose is not successful in 20 to 30 minutes, a second dose should be administered.

Apomorphine is the other generally available emetic. An injection of 0.07 to 0.1 mg per kg of body weight is administered subcutaneously or intramuscularly and therefore can be given to an uncooperative patient. It acts centrally and has an onset of action of approximately four minutes.¹³ Other advantages are that apomorphine is not affected by administration of activated charcoal and promotes proximal small bowel reflux.^{8,11} The major disadvantage is that it is dispensed as a tablet and in most hospitals must be prepared fresh for injection each time it is to be used. Should one dose fail to induce vomiting, sub-

sequent doses are of no value and ipecac or lavage must be substituted. A controversial point is the degree of CNS depression which occurs with its use. Corby and Decker feel it causes little CNS depression and they endorse apomorphine.¹⁴ However, MacLean feels the CNS depression is significant enough to recommend ipecac instead.¹³ We too have observed significant CNS depression with apomorphine in adults and also prefer ipecac. Should significant CNS depression or protracted vomiting occur, either might be reversed with the usual dose of naloxone.

Gastric aspiration-lavage is the technique of choice in overdosed patients who are suffering from CNS depression and therefore are not suitable for induction of emesis. If the ingested material contains petroleum distillates, use of lavage is again controversial because of the potential danger of aspiration. However, if large amounts of petroleum products are ingested and the patient is not a candidate for emesis, careful lavage should be undertaken.^{12,15} When the ingested material is a convulsant or is caustic in nature, lavage is contraindicated.

The proper lavage technique is essential to avoid complications and provide maximum efficiency. The patient is placed on his left side in the Trendelenburg position.¹⁰ To prevent pulmonary aspiration, a cuffed endotracheal tube should be inserted whenever possible. Suction apparatus must always be available in the event vomiting occurs. The lavage tube should be as large as possible (at least a 31 F in adults), and we have found it useful to cut supplemental large holes randomly over the distal three or four inches of the tube to facilitate removal of particles. Preferably the tube is passed through the mouth and is carefully checked for position to be sure it is not in the trachea or a large bronchus. A bite block or oral airway may be helpful to prevent occlusion of the tube by mouth closure. Aspiration of gastric contents is done first. Lavage is then carried out with approximately 300 ml of saline per run in adults and proportionately smaller amounts in children. The total volume of fluid used must be large (2 to 8 liters). Saline is preferred because of the potential danger of dilutional hyponatremia with water but the possibility of hypokalemia, although rare, still exists. In the group of patients too depressed for induction of emesis yet too responsive to allow intubation, we feel cautious lavage is still indicated. In our experience, lavage can be accomplished with a very

low incidence of pulmonary aspiration if done with care and attention is paid to details.

The uncertainties involving the techniques of gastric emptying have prompted a reevaluation of activated charcoal as a gastrointestinal tract decontaminant.¹⁶ In 1963 Holt and Holz renewed interest in the use of activated charcoal,¹⁷ but it remained for Corby and co-workers to emphasize its value.¹⁶ Activated charcoal is the odorless, tasteless residue of various organic products.¹⁸ It is a fine black powder with a large surface area and therefore is quite adsorbent. Sufficient tap water is added to the powder to bring all the charcoal into suspension. This aqueous slurry is either given to the patient to drink or administered via a nasogastric tube. Decker and associates have shown charcoal alone to be as effective as apomorphine-induced emesis in salicylate ingestion, but more importantly, demonstrated that emesis combined with charcoal is more valuable than either emesis or charcoal used alone.¹⁹ Activated charcoal has a wide spectrum of activity which includes propoxyphene, barbiturates and glutethimide.^{16,20} However, it is inactivated by cyanide and is a poor adsorbent of ferrous sulfate,¹⁸ ethanol, methanol, caustic alkalis and mineral acids.¹⁸

Since activated charcoal is most effective if given early, it should be readily available for use outside the hospital by laymen or paramedical personnel. The recommended dose is based on the amount of drug ingested. A ratio of at least five grams of charcoal to each one gram of poison is recommended but a ten to one ratio is preferable, and is necessary if food is present in the stomach. If the amount of poison ingested is unknown, a dose of 15 to 30 grams is suggested. The poison-charcoal complex remains stable throughout the gastrointestinal tract and will turn the stool black as it is excreted. Since charcoal is free of side effects, it can be given without fear. However, its indiscriminate use may lead to a false sense of security for a physician,¹⁸ and therefore a list of substances adsorbed by activated charcoal should be consulted.²⁰

Several regimens of administration of activated charcoal are available. It may be given orally at the time of subcutaneous or intramuscular administration of apomorphine. Alternately, it may be given *following* ipecac-induced vomiting. Although this regimen has not been fully evaluated, it has been alluded to in the literature¹⁶ and seems quite logical. It avoids the possible disadvantages of apomorphine yet allows use of the activated char-

coal adjunct. In our emergency department we prefer emesis to empty the stomach if no contraindications exist. Ipecac is routinely used and when vomiting has ceased, a slurry of activated charcoal is given. However, in an uncooperative but otherwise suitable patient apomorphine may be employed as the emetic with the charcoal given concomitantly.

If lavage must be employed, 50 grams of charcoal can be added to 500 ml of saline to use as the lavage fluid. This obscures one end point (clear return) of lavage, but provided large volumes are used, is a very satisfactory technique. We prefer routine saline lavage followed by 30 grams of activated charcoal left in the stomach at the end of the procedure.

To hasten elimination of ingested products from the gastrointestinal tract, the use of cathartics has been suggested despite little evidence proving their efficacy. De Castro feels laxatives are not as effective as gastric lavage or emesis but may serve as another adjunctive measure.² They should not be employed if corrosives have been ingested or for patients in whom electrolyte disturbances are shown to exist.²¹ We prefer magnesium citrate, but sodium phosphate or sodium sulfate may also be used.

General Care

The general care of a severely ill overdose patient does not differ greatly from the care of any critically ill or comatose patient. Although specific antidotes are available for a small number of poisons,^{21,22} supportive care must receive the major emphasis. Careful fluid and electrolyte balance, preventative skin care, prophylaxis against deep venous thrombosis and attention to urinary and intravenous catheter sites decrease rates of morbidity and mortality in such patients. Respiratory care must be particularly aggressive as pulmonary complications are the leading cause of death in overdosed patients.²⁰

Despite seemingly adequate conservative therapy, special therapeutic approaches may be necessary in a minority of cases. Forced diuresis, alkalization of urine, peritoneal or hemodialysis may be useful for a particular poison but none of these techniques is routinely indicated. Before undertaking a specialized form of treatment it is necessary to consider the metabolism and route or routes of excretion of the toxin as well as the experiences other physicians have had with treating similar overdoses.²⁰

Conclusion

We have attempted to provide a concise treatment outline for a physician who is faced with an overdosed patient. It is hoped that adherence to these guidelines will help lower the morbidity and mortality of overdose.

Summary

Successful management of patients who have taken excessive quantities of a drug or poison depends on prompt recognition and treatment. After support of vital functions and rapid evaluation, early efforts are directed at minimizing further absorption of the toxin. Induction of emesis by syrup of ipecac or apomorphine is usually the preferred method to empty the stomach in suitable patients. If lavage is employed, meticulous attention to details will decrease morbidity. Activated charcoal is a useful adjunct to therapy and can be used with emetics or lavage techniques. Cathartics may be used but their usefulness has not been proven.

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